MONITORING PLAN

PROJECT NO. BA-28 VEGETATIVE PLANTINGS OF DREDGE MATERIAL DISPOSAL SITE ON GRAND TERRE ISLAND

DATE: May 9, 2001

Project Description

Vegetative Plantings of Dredge Material Disposal Site on Grand Terre Island (BA-28) Restoration project consists of planting desired perennial vegetative species on dredge material to produce a desired plant community. The project is sponsored by National Marine Fisheries Service (NMFS) and the Louisiana Department of Natural Resources/Coastal Restoration Division (LDNR/CRD) under the Coastal Wetlands Planning, Protection, and Restoration Act (CWPPRA, Public Law 101-646, Title III, Priority List VII).

West Grand Terre Island is centered at Latitude 29°17'15" north, Longitude 89°55'00" west, in Jefferson Parish, Louisiana (Figure 1). It is approximately 50 mi (80 km) south-southwest of New Orleans. It is bounded on the north by Barataria Bay, on the south by the Gulf of Mexico, on the east by Pass Abel, and on the west by Barataria Pass (Williams et al. 1992). The project area is located within an area approximately 200 acres (80.9 ha) in size on the eastern portion of the island (Figure 2).

Two dredge disposal events were completed inside the project boundary by the Army Corps of Engineers - New Orleans District (ACOE-NOD). The first one was completed through assistance from the Beneficial Use of Dredged Materials Program (BUMP). From July 24th through September 5th 1996, 666,258 cubic yards of sandy material were pumped into two cells contained by earthen dikes located parallel to the Gulf of Mexico and including the eastern recurved spit. The dredged slurry was pumped during routine maintenance of the Barataria Bay Waterway (BBWW) Bar Channel Reach (mile 0 to mile -3.8) to an estimated initial elevation of +9.0 ft Mean Low Gulf (+8.2 ft NGVD) into a 115 acre (46.5 ha) cell, and to +5.0 ft MLG (+4.2 ft NGVD) into a 5.0 acre (2.0 ha) cell. On November 17, 1998 follow-up profile surveys were conducted along three established transects across the 1996 disposal area. The maximum relief along the profiles was 9.8 MLG (9.1 ft NGVD) at the Gulf-side levee on the eastern transect and the average relief was 3.6ft MLG (2.8 ft NGVD; Penland et al 1999: pp. 1-7, 1-35). In 1999, a second dredge event funded by the ACOE-NOD and the Louisiana Department of Natural Resources (LDNR) was completed. The slurry was pumped into an 80 acre (32.4 ha) cell along the northern flank of the1996 disposal area, excluding the eastern spit. The construction of a rock containment dike on the bay side of the project area was completed during the summer of 1999.

West Grand Terre is part of the Plaquemines barrier island arc, the youngest barrier system of four in Louisiana waters. The arc is approximately 30 mi (48 km) in length from west Grand Terre Island

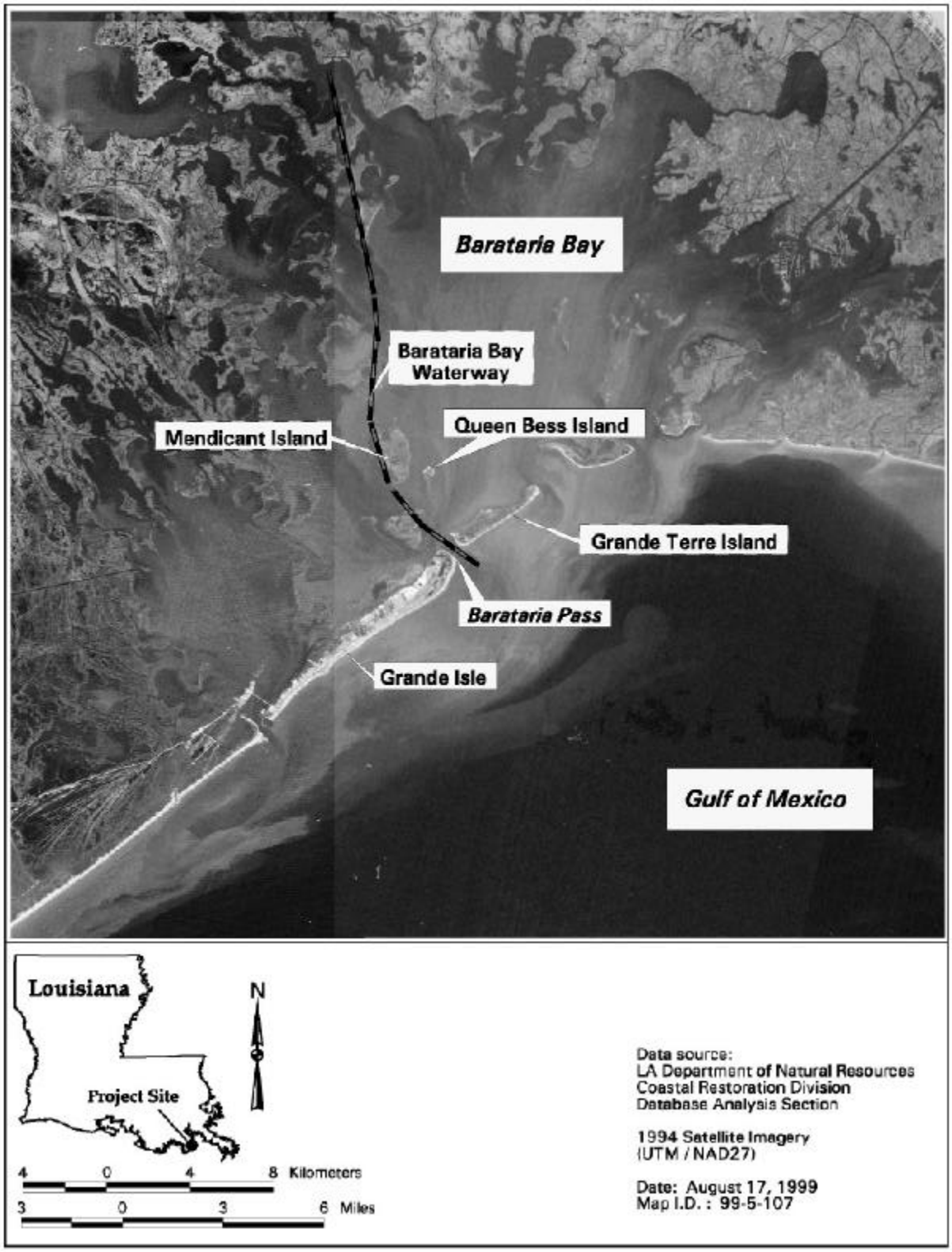


Figure 1. Location of West Grand Terre Island along mile 3 of the Barataria Bay Waterway for Vegetative Planting of Dredge Material Disposal Site on Grand Terre Island (BA-28) project.

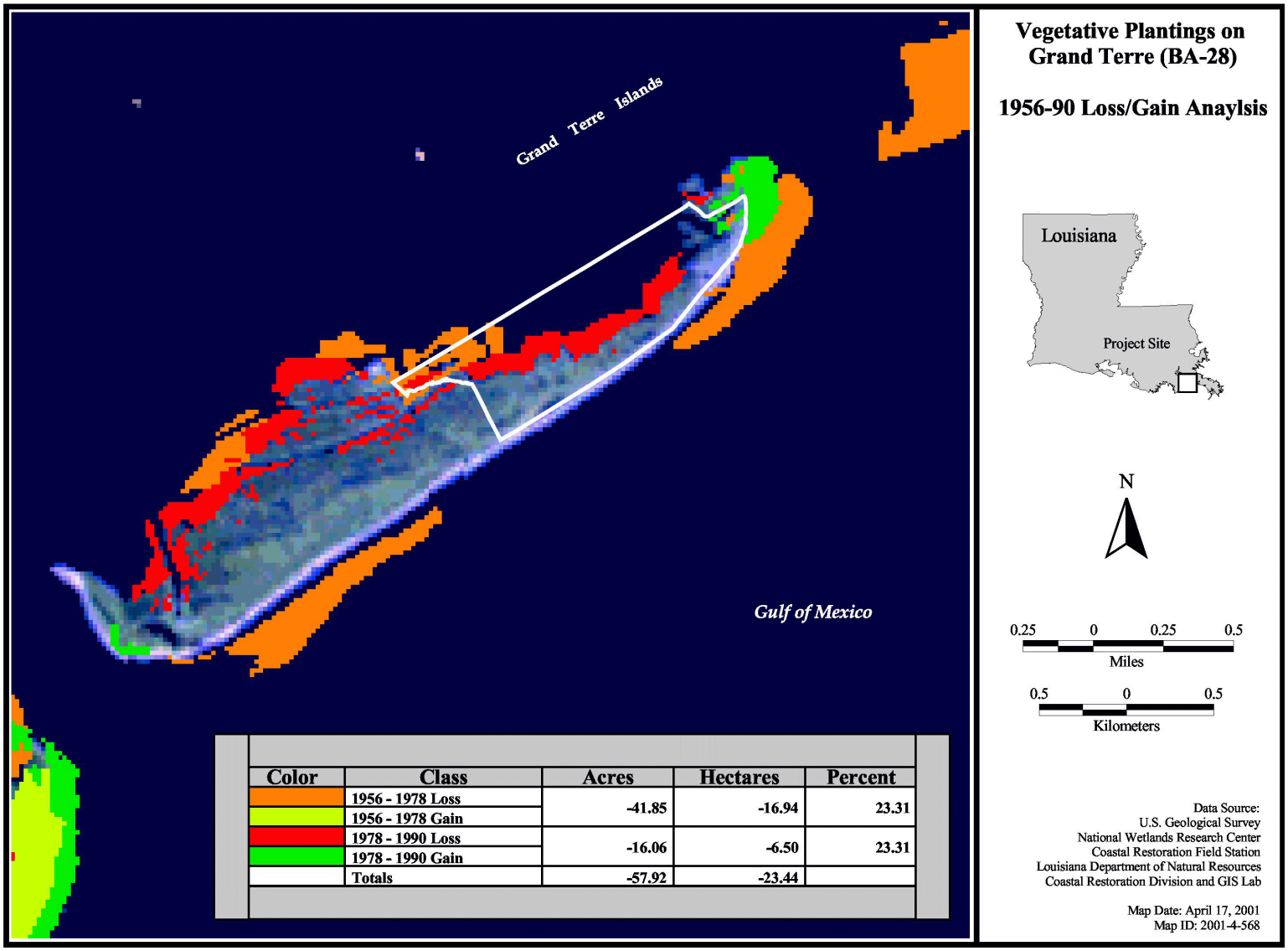
Figure 2. Project boundary map for Vegetative Planting of Dredge Disposal Site on Grand Terre Island (BA-28) project.

to Sandy Point (McBride et al 1991). The transgressive Plaquemines barrier island arc formed from the multiple headlands of Bayou Robinson, Bayou Grand, and Dry Cypress Bayou. Abandonment of the headlands occurred approximately 350 yrs. B.P. Subsequent marine processes reworked the sandy headlands into a flanking barrier shoreline. Marsh subsidence detached the barrier shoreline from the headland and created the Plaquemines barrier island arc (Laboratory for Wetland Soils and Sediments 1987). In 1884, Grand Terre was one large barrier island. It was bordered on the west by Barataria Pass and on the east by Quatre Bayoux Pass. Breaches divided it into three remnants by 1956. By 1988 the westernmost breach expanded to form a tide-dominated inlet, Pass Abel, where the middle remnant once stood. Only East Grand Terre and West Grand Terre remain today (Williams et al 1992).

West Grand Terre is experiencing in-place-breakup. The current rise in sea level, marsh subsidence, a dwindling sediment supply, wave processes, tropical and extratropical storms, and intense human disturbance are all contributing to the island's shoreline losses (McBride et al 1991). It has the typical topography of a low-relief Louisiana barrier island. Its dunes are few in number and provide little resistance to overwash by frequent storms, therefore shoreline erosion dominates the barrier's shoreline processes (Penland et al 1999).

From 1887-1988 the Plaquemines barrier shoreline experienced a progradation rate of 1.3 ft yr^{-1} (0.40 m yr^{-1}) on the bayside and eroded at a rate of 18.0 ft yr^{-1} (5.5 m yr^{-1}) on the gulfside (Williams et al 1992). West Grand Terre had a total area of 547.9 acres (221.7 ha) in December 1985 and 468.7 acres (189.7 ha) by October 1997, a 14.5% decrease in area and an overall land loss rate of 6.7 acres yr^{-1} (2.7 ha yr^{-1}), during this approximate twelve year period. The only areas of progradation during this time were on the east and west ends of the island due to natural recurved spit growth due to longshore transport (Penland et al 1999). Within the project boundary there was a total area decrease of 57.92 acres (23.44 ha) between 1956 and 1990 or approximately 1.64 acres yr^{-1} (0.67ha yr^{-1}; Figure 3). During the same time period, if areas outside the project boundary are also considered, the area decrease totaled 152.43 acres (61.69 ha) or 4.36 acres yr^{-1} (1.76 ha yr^{-1}; Figures 4 & 5). The lower amount is probably due to the project area not including those actively eroding areas along the southeastern tip of the island.

West Grand Terre has a semi-tropical climate with a mean annual precipitation of approximately 63 in (160 cm) spread fairly uniformly throughout the year. The maximum precipitation usually occurs in July and the minimum usually occurs in October. Tropical storms and hurricanes occur along the coastline typically between June and November, creating severe flooding as well as drastic changes in hydrologic regimes in the surrounding Barataria basin. Mean annual air temperatures vary from 13°C in January to 27.5°C in July. The coldest nights bring on occasional freezes, but thawing is usually rapid after sunrise. Winds have an overall easterly component. They are predominantly south and southeasterly during the spring and summer, and north and northeasterly during the fall and winter (Conner and Day 1987). Average water temperatures range from 18°C (64°F) in February to 29°C (84°F) in August. West Grand Terre is located in a low tidal environment where the average tidal range is approximately 1.2 ft (37 cm) and the maximum range is about 1.9 ft. (58 cm). Tides can reach elevations of about 10 ft (3 m) during storms and hurricanes, while northerly



Color	Class	Acres	Hectares	Percent
	1956 - 1978 Loss	-41.85	-16.94	23.31
	1956 - 1978 Gain			
	1978 - 1990 Loss	-16.06	-6.50	23.31
	1978 - 1990 Gain			
	Totals	-57.92	-23.44	

Figure 3. **1956-1990 loss/gain analysis map of area within project boundary for Vegetative Planting of Dredge Disposal Site on Grand Terre Island (BA-28) project.**

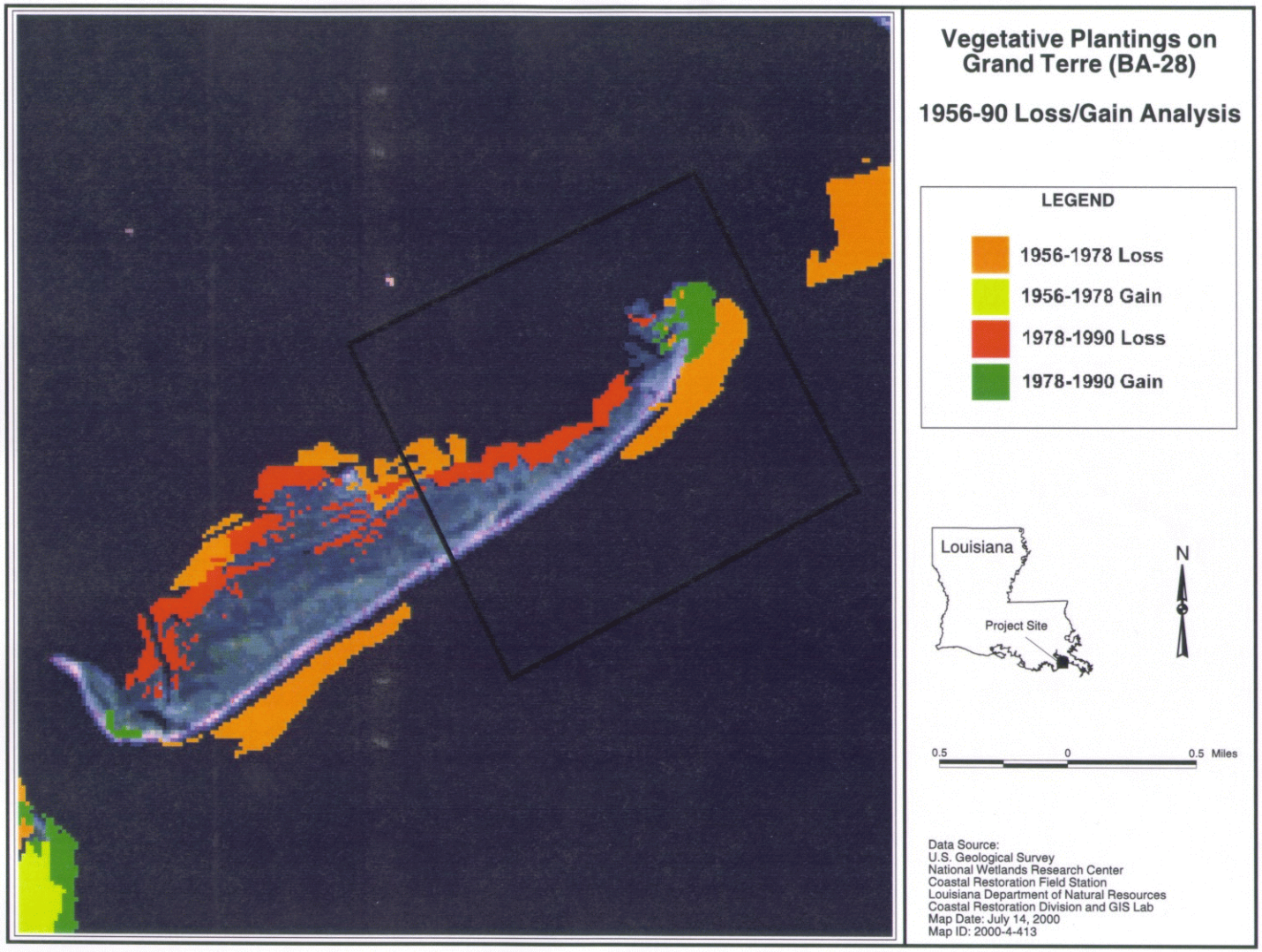


Figure 4. **1956-1990 loss/gain analysis map including areas adjacent to project boundary for Vegetative Planting of Dredge Disposal Site on Grand Terre Island (BA-28) project.**

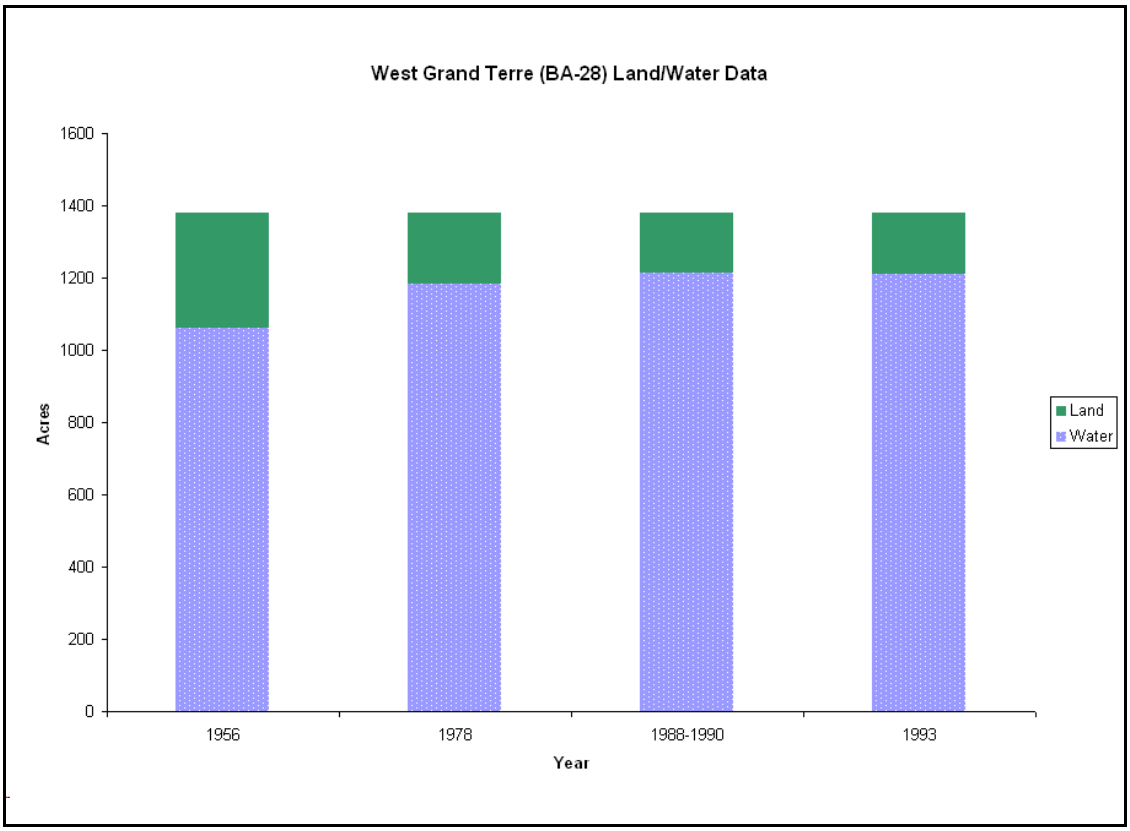


Figure 5 Loss/Gain analysis of West Grand Terre project area as delineated on map in figure 4 for Vegetative Planting of Dredge Disposal Site on Grand Terre Island (BA-28) project.

winds associated with frontal passages in the winter can lower water levels to as much as 2.6 ft (79 cm) below mean sea level (Mendelssohn and Hester 1988).

The project area is characterized as a salt marsh vegetative community typified by *Spartina alterniflora* (smooth cordgrass). Vegetation profiles from the November 1998 surveys of the spoil areas indicated that they were being colonized by annual beach species and by perennial species that remained alive throughout the disposal events. The flat recurved spit was colonized by *Spartina patens* (marshhay cordgrass), with scattered plants of *Ipomoea pes-caprae* (goat's foot morning glory) and *Hydrocotyle bonariensis* (sea-side pennywort). The earthen dikes had barrier island grassland and shrub/scrub communities with species such as *S. patens, Sesbania drummondii* (yellow rattle-box), *Croton punctatus* (beach tea), *Baccharis halimifolia* (groundsel bush), and *Iva frutescens* (marsh elder). The sand flats and overwash areas were colonized with *Philoxerus vermicularis* (silverhead), *Distichlis spicata* (salt grass), *Borrichia frutescens* (sea ox-eye), and *Salicornia bigelovii* (glasswort; Penland et al 1999: 1-39). Field observations of the spoil from the 1999 dredge operation indicate that the area is largely unvegetated, with *Salicornia sp.* being the dominant vegetation type. Small amounts of *S. alterniflora* were noted in an area with some tidal connection (Sweeney 2001).

This project is designed to vegetate spoil areas on the eastern portion of West Grand Terre with perennials endemic to Louisiana's barrier habitats. Vegetative restoration on barrier islands has proven successful. The artificial establishment (planting) of vegetation on spoil-filled areas has accelerated vegetative recruitment and vegetative cover (Hester et al 1992).

The project features include:

The removal of feral herbivores (approximately 20 goats and 70 cows) from the island between August 15 - September 30, 1999, and the establishment of vegetation utilizing hand planted nursery grown selected plant species in May 2001. Vegetation will include 35,000 vegetative plugs of *S. alterniflora* cv. Vermilion and 600 tube containers of *Avicennia germinans* cv. Pelican (black mangrove) planted near the rock containment dike on the Barataria Bay side of the project area; 3,100 four inch containers each of *S. patens*, *Panicum amarum* var. *amarum* cv. Fourchon (bitter panicum), and *Spartina spartinae* (gulf cordgrass) on the foredune outside of the spoil disposal areas on the Gulf of Mexico side of the project area (Figures 6 and 7).

Project Objective

To vegetate the Army Corps of Engineers sediment disposal areas of West Grand Terre with perennials indigenous to the barrier island's dune, swale, and intertidal marsh habitats.

Specific Goal

To increase vegetation cover of these selected species; *S. alterniflora, A. germinans, S. patens, S. spartinae,* and *P. amarum* through installation of vegetation plantings.

Monitoring Limitations

The 20 year duration of this project introduces the possibility of future disposal events and vegetative plantings without the exact knowledge of their time frames. Vegetation sampling and analysis of plantings done in conjunction with other projects would make conclusions difficult. Therefore, vegetation sampling will be conducted on the first plantings slated for the spring of 2001, and not on any future plantings. This will allow intensive data collection under well controlled sample design to facilitate the best information possible to be reported. Additionally, although the removal of approximately 90 feral herbivores is a project feature which directly ties into the project goal and specific objectives, how much this has impacted the success of this project would be impossible to estimate. This project feature will not be monitored.

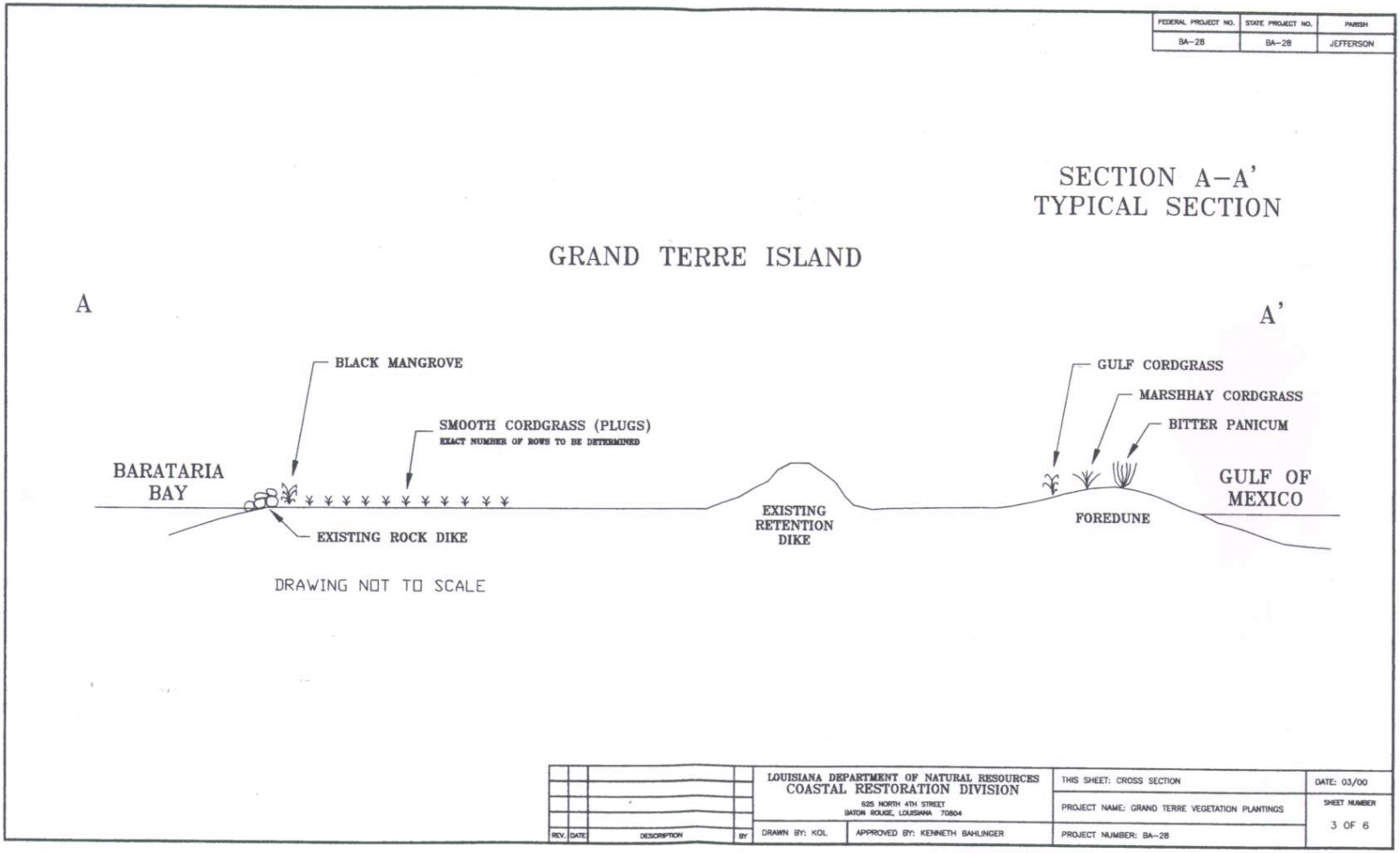


Figure 6. Schematic of vegetation layout for Vegetative Planting of Dredge Material Disposal Site on Grand Terre (BA-28) project.

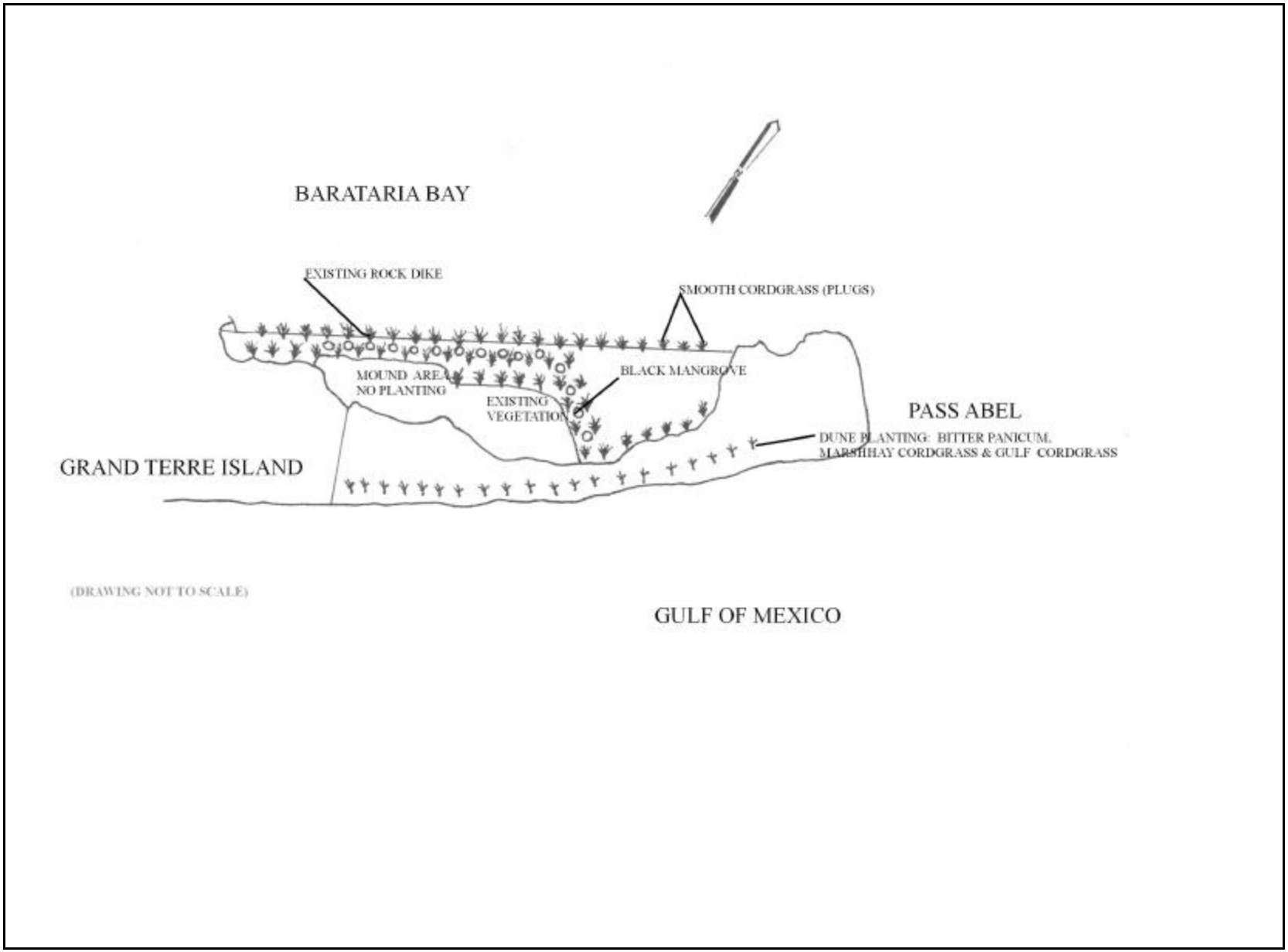


Figure 7. Plan view of planting layout for Vegetative Planting of Dredge Material Disposal Site on Grand Terre (BA-28) project.

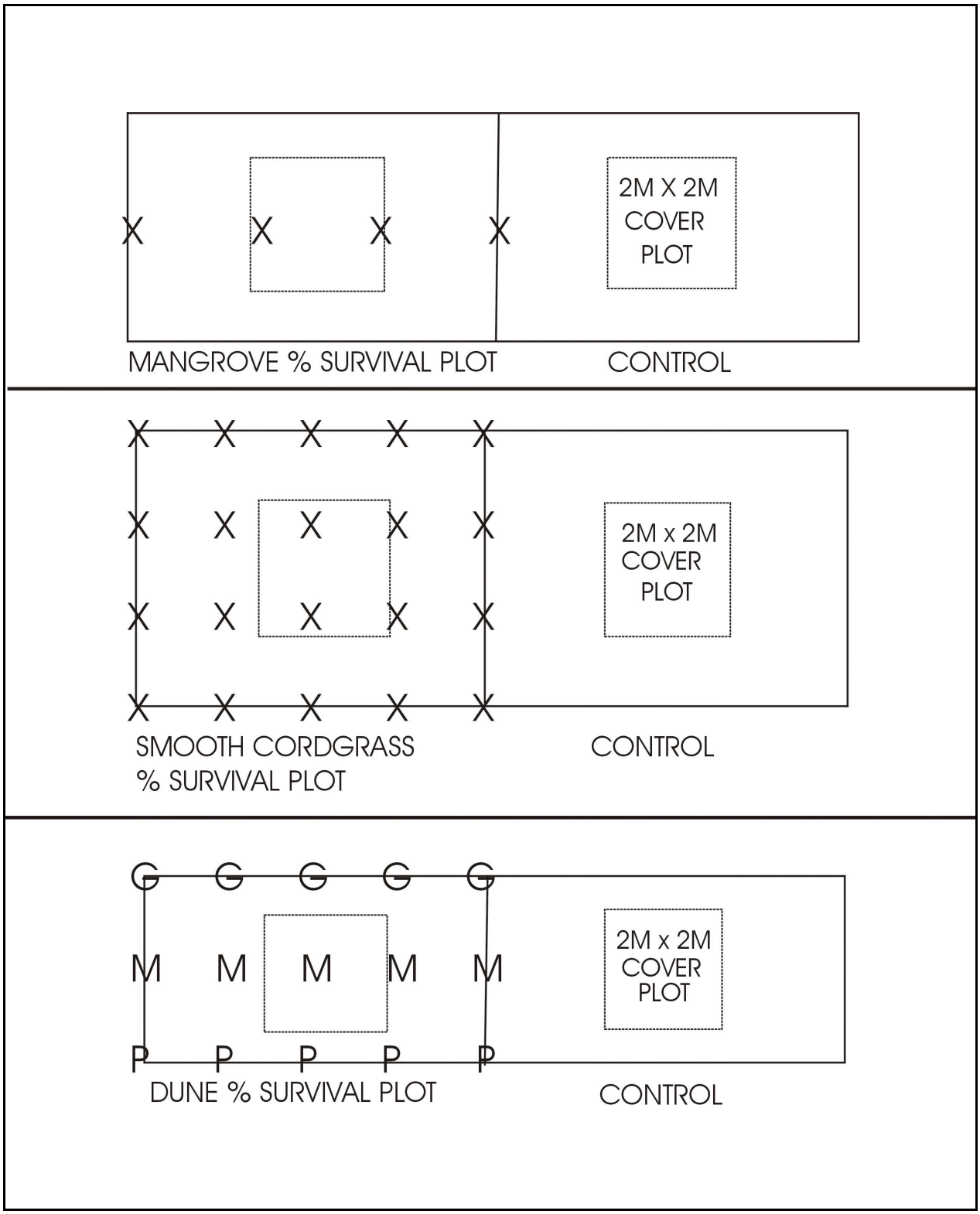


Figure 8. Sample treatment plot layout for Vegetative Planting of Dredge Material Disposal Site on Grand Terre (BA-28) project. In the dune treatment plot: G = Gulf Cordgrass, M = Marshhay Cordgrass, and P = Bitter Panicum.

Monitoring Elements

The following monitoring elements will provide the information necessary to evaluate the specific goal listed above.

Vegetation Analysis — To determine species composition, % cover, and % survival of planted species, hand planted vegetation will be monitored in approximately 120 randomly placed plots within the planting area. Plots will be established for three different treatments. The dune treatment will consist of one row each of *P. amarum*, *S. patens*, and *S. spartinae*. The *A. germinans* treatment will be within the dredge material areas immediately adjacent to the rock dike. The *S. alterniflora* treatment will be in the spoil area from the rock dike south toward the dune (Figure 7). Plot configuration will match the "typical" planting specification. At the same time, a control plot will be randomly established next to each sample treatment plot and remain unplanted. Percent cover will be measured within a 6.6ft x 6.6ft (2m x 2m) subplot placed in the center of each vegetation planting plot (Figure 8). Percent cover will be measured by estimating the percent cover of the ground area covered by each species identified within the subplots. Percent survival of planted species will be determined using 15 plants at each dune plot, 4 plants at each *A. germinans* plot, and 20 plants at each *S. alterniflora* plot. To document the establishment of vegetation, sampling will be conducted at pre-planting in the spring of 2001. Sampling will be conducted 1 growing season post-planting (fall of 2001), 2 and 3 growing seasons post-planting (fall of 2002 and fall of 2003), or until the original plants are indistinguishable. Lateral spread will be measured by randomly selecting 4 or 5 transplants in a plot, depending on treatment type, and counting the number of stems per transplant, then measuring the greatest distance at ground level between two tillers of the plant.

Habitat mapping — To determine vegetation cover and land loss rates, Beneficial Use of Dredged Material Program (BUMP) data reports will be utilized.

Anticipated Statistical Tests and Hypotheses

The following hypotheses correspond with the monitoring elements and will be used to evaluate the accomplishment of the project goal.

Analysis of Variance (ANOVA), descriptive, and summary statistics will be used to evaluate vegetative growth (first year analyses will concentrate on descriptive and summary statistics). Analysis will be based on percent cover of the species present, and % survival of planted vegetation. If we fail to reject the null hypothesis, we will investigate for negative effects.

This ANOVA will allow for the analysis and long-term documentation of vegetative coverage changes on the west Grand Terre project site from time 0 (immediate post-construction) to the end of the project. ANOVA tests will be conducted for each of the three treatments to determine treatment effects.

Goal: Increase the % cover of planted vegetation throughout the spoil area.

Hypothesis A:

H_o: Percent cover of planted vegetation in treatment$_i$ at year$_i$ will not be significantly greater than the percent cover of planted vegetation in treatment$_i$ at year$_0$.

H_a: Percent cover of planted vegetation in treatment$_i$ at year$_i$ will be significantly greater than the percent cover of planted vegetation in treatment$_i$ at year$_0$.

Hypothesis B:

H_o: Percent cover of planted species in the control plots at year$_i$ will not be significantly greater than the percent cover of planted species in treatment$_i$ at year$_i$.

H_a: Percent cover of planted species in the control plots at year$_i$ will be significantly greater than the percent cover of planted species in treatment$_i$ at year$_i$.

Descriptive and summary statistics will be used on both historical data and data from BUMP aerial photography collected during pre-project and post-project implementation to assess habitat analysis of the island. This analysis will allow for the evaluation of the project goal.

Notes

1.	Implementation:	Start Plantings:	April 19, 2001
		End Plantings:	June 19, 2001
2.	NMFS Point of Contact:	Rachel Sweeney	(225) 389-0508
3.	DNR Project Manager:	Kenneth Bahlinger	(225) 342-7362
	DNR Monitoring Supervisor:	Darin Lee	(504) 447-0990
	DNR Monitoring Manager:	Elaine Lear	(504) 477-0974

4. The 20 year monitoring plan development and implementation budget for this project is $146,932. Annual summary data graphics reporting on the internet will be available in 2002 and 2003, and a comprehensive report will be available in 2004. These reports will describe the status and effectiveness of the project. Additionally, BUMP annual monitoring reports are made available on their internet web site upon their release to the public.

5. References:

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